

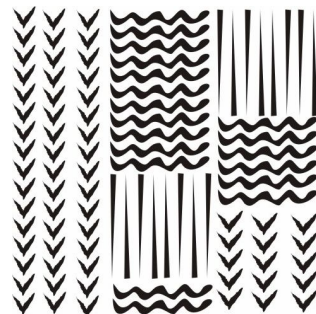
DRAFT PAPER

**EVOLUTION OF THE STUDY OF
COST OF CULTIVATION IN INDIA**

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**STUDYING VILLAGE ECONOMIES IN INDIA
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EVOLUTION OF THE STUDY OF COST OF CULTIVATION IN INDIA

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This paper reviews the evolution of methods to study the costs of cultivation of crops and farm incomes in India since the colonial period. In India, where a large section of the population depends on agriculture for its livelihood, it is important to have detailed estimates of the costs incurred, returns realised, and net income derived from farming in order to formulate appropriate farm policies and study the impact of various policy measures on the well-being of cultivators.

1 PHASES IN THE STUDY OF COST OF CULTIVATION

Rath (1960) divided the progress of research in agricultural economics starting from the period of the East India Company till the 1940s into four phases.² In the first phase, which lasted until 1858, information came mainly from travelogues and documents relating to Survey and Settlement reports. The second phase identified by Rath was from 1859 to 1880, during which period reports on inquiries into famines in India and into the Deccan riots were prepared. The third phase covered the period from 1880 to 1912-1916, in which several District Gazetteers, the Irrigation Commission Reports and Voelcker's study on problems of Indian agriculture were published. The fourth phase extended from 1912-16 to 1939-40, a period in which village studies were carried out to study specific problems pertaining to different regions.

I have tried to classify historical phases in the study of economics of farm management in India. With regard to the methodology followed, cost concepts used, geographical coverage, representation of various types of farming situations in different regions and comparability across space and time, there can be said to be four historical phases,

¹ I am grateful to V. K. Ramachandran and Madhura Swaminathan for advice and comments on this paper. However, errors if any are mine.

² Rath (1960), *A Critical Review of Research in Agricultural Economics in India*, Poona University, Poona, cited in Shah (1971, p. 2).

corresponding to four different types of studies.³ The first phase in the study of farm economy was the period up to the first decade of twentieth century, when information regarding costs and returns were to be found in the Settlement Reports for different regions of the country. The second phase was from the first decade of the twentieth century to the early 1950s, when various aspects of the cultivation of crops were studied as part of village studies conducted in different parts of the country. The third phase, from early 1950 to 1970-71, was the beginning of the period of large-scale surveys, particularly the Farm Management Studies, which spread across different regions at different time periods. The fourth phase, from 1970-71 onwards, began with the introduction of the Comprehensive Scheme for the Study of Cost of Cultivation of Crops which collects in-depth data on various aspects of farm economy across major States in India on an annual basis.

1.1 Period of settlement surveys: The first phase

In the period up to first decade of twentieth century, the main source of farm management information came from cost of cultivation information that was estimated as part of the Settlement Records maintained by the British administrators. In order to make the settlements, the British collected information on land values, yields of crops, gross produce from cultivation and the costs and expenses incurred in cultivating the land. The objective of collecting such information was to calculate the 'net asset' (in *zamindari* areas) or 'net produce' (in *ryotwari* areas) from various types of land, with a certain proportion of this 'net asset' or 'net produce', being fixed as the revenue to be paid to the Government (Ray, 1915). The method and year of settlement varied, of course, between different regions of the country. In particular, the Bengal presidency was

³ Although I have classified the different types of studies broadly into four historical phases, there is no rigid demarcation between these phases, since studies in one phase often carried over the succeeding one. For example in some regions, Survey and Settlement reports continued till 1940. Village studies in different parts of the country continue to make substantial contributions to the study of farm economy.

under Permanent Settlement while the rest of the British India was under different types of temporary and permanent settlements.⁴

One of the earliest efforts in studying economics of farming as part of the Settlements was by Colonel Read, who investigated the systems of cropping and costs of cultivation of crops in Baramahal in 1792-1800 (Thomas and Sastry, 1939, p. 2; Thomas and Ramakrishnan, 1940, p. xi). Settlement surveys started with a topographical survey of the territory followed by a demographic and economic survey. The surveys yielded information on production from different types of land, prices of the produce, average expense on cultivation of crops, wages of labour in cash and kind and statements of cultivators' family accounts in the region.⁵ In order to conduct these surveys, general rules were framed and sent to the Collectors of Districts for guidance. However, it was noted that "although the rules and instructions framed by Munro were transmitted to each Collector for his guidance, no two Collectors executed the survey in the same manner."⁶ As Mukherjee (1962) observed that

From the study of the methods of Ryotwari survey, as it was executed in different districts before the temporary break down of the system, the fact remains that it was not done on a uniform principle. The details of the Ryotwari survey varied from district to district according to the views and capacity of the Collectors...Every change of Collector was followed by a change of methods (Mukherjee, 1962, p. 143).

In order to assess the revenue to be collected from land in *ryotwari* areas, detailed surveys of individual fields were carried out and the fields surveyed were classified on the basis of soil type and grain produced (Ray, 1915). The grain output from each field was converted into value terms, using the average price for an extended period of time (*ibid.*).⁷ From this

⁴ It is to be noted that a large part of the Madras presidency was under *ryotwari* system, some areas, where land was in the possession of *zamindars*, were permanently settled. Ray (1915) notes that, in permanent settlement "the assessment [was] fixed at two thirds of half the gross produce estimated on an average of the previous thirteen years. That is to say, half the produce was left to the cultivator, one-sixth was to be the *zamindar's* share, and the remainder, two-sixths, was the Government revenue" (p. 60).

⁵ Captain Read to Lord Cornwallis: Baramahal Records, July 1, 1793, cited in Mukherjee (1962), p. 127.

⁶ Minute of Cochrane, 8th December, 1820: General Reports of the Board, January, 4 1821, Vol. 29, p. 231, para 16. cited in Mukherjee (1962, pp. 148-9).

⁷ Generally the average price was the average of the prices that prevailed in the 20-year (excluding famine years) period preceding the settlement year.

gross value of produce, the cost of cultivation was deducted to calculate the net produce from individual plots (*ibid.*). Describing the methods followed in calculating the cost of cultivation, Ray (1915) observed that

The items of cost of cultivation included in the estimate are (1) ploughing cattle, (2) agricultural implements, (3) seed, (4) manure, and (5) labour required for ploughing, sowing reaping, etc... The method of calculation varies according to the description of crops grown, the method of cultivation, as well as according to the mode in which these items are paid in each district... The payments made in grain [for the inputs used] are converted into money at the commutation price adopted for settlement. The cost of bullocks and of the implements of husbandry is distributed over the number of years during which they are estimated to be serviceable, and the other items are calculated for each year... (Ray, 1915. p. 74).

On further analysis of the estimation of cost of cultivation, he pointed out certain problems in the methodology followed for arriving at a figure for the cost of cultivation. According to Ray,

Calculations are first made for the area which can be cultivated with one plough and one pair of bullocks, and the required calculations for an acre are deduced from them. The usual practice is to work out the expenses for the best soil, and then to diminish this standard proportionately according to the quality of the soil. This method is open to objection on the ground that the cost of cultivating poor soils is greater if a maximum yield is sought there from than superior soils. (Ray, 1915. p. 74)

In Bombay, too, land settlements were based on estimates of profits from agriculture, as estimated by the Civil Servant Robert Keith Pringle in 1828.⁸ In the settlement surveys in Bombay, Pringle calculated the net produce from different classes of soil by deducting the cost of cultivation from the gross produce (Gordon, 1917). According to Gordon:

The cost of cultivation was calculated in the most extra ordinary detail, including not only the expenses of the labour, seed, bullock etc., but also such items as insurance against loss of cattle, fees to artificers and even the cost of propitiating the local deity at harvest time. So minute in fact were these enquiries that some of the *kalfiats* as they were called, ran into roll of paper 30 yards in length. The average gross produce was then converted to money at an average of prices for past years, and the net produce found by deducting the cost of cultivation (Gordon, 1917, p. 29).

Although a detailed calculation for estimating the gross value of produce, cost of cultivation and the net produce were followed by Pringle, the system did not work well.

As Gordon pointed out:⁹

⁸ Ray (1915) noted that Pringle's settlement tried to fix fifty percent of the net produce as the government demand and this required that information be obtained on the yields and cost of cultivation of various crops in different soil conditions (Ray, 1915, p. 80).

⁹ Ray (1915) also observed that "the execution of MR. PRINGLE's survey was entrusted to a native agency without either the experience of integrity needed for the task, and at a subsequent period the results obtained were found to be nearly worthless. The preliminary work of measurement was grossly faulty, and the estimates of produce, which formed such an important element in the determination of the assessment

The assessments could never be collected and the old system of annual remissions with all their attendant evils came into force. Further, the survey itself was found very defective and vitiated by fraud; in fact, several of Mr. Pringle's subordinates were criminally prosecuted and convicted (*ibid.*, 1917).

In regions of Permanent Settlement, information was collected to assess the 'net assets' by deducting the cost of cultivation, allowances for regional characteristics, and seasonal variations from gross produce.¹⁰ The surveys carried out as part of settlement operations in permanently settled regions also enquired into the economic and material conditions of people in the regions covered under the survey (GOB, 1916). In selected regions, the settlement reports gave estimates of cost of cultivation and income among various sections of the rural population. For example, in the settlement report of districts of Pabna and Bogra, MacPherson presented household budgets that gave estimates of cost and returns from cultivation for an 'average cultivator', 'poor cultivator' and a 'well-to-do cultivator' (classified based on the extent and nature of tenure of the land cultivated) in two different blocks in Pabna district (GOB, 1930). These estimates were based entirely on the statements given by the people. MacPherson observed:

The Assistant Settlement Officers in each block were instructed to choose four families of cultivators whose material condition they considered, after seeing them and their houses, to be typical of the average condition of the people in their area: then two of the very poorest families, one family below average, one family above average and one family considered by local standards to be well off (GOB, 1930, p. 35)

The selection of the households, and methods of collecting data and estimating various items of costs and returns in the settlement surveys were highly subjective and varied between regions and the personnel who conducted the studies. The estimates derived hence could not be used as representative for the region.

These enquiries into the profitability of cultivation were to assist the administrators in assessing the material conditions of the people and fix revenue accordingly. The

and which had been prepared in the most elaborate manner, were so erroneous as to be worse than worthless" (Ray, 1915, p. 90).

¹⁰ But Baden-Powell (1892) remarked "the amount [revenue] was not determined, not with reference to any area survey, any consideration, that is, of the number, various fertility, or productive power, of the acres held in each case, or of the influence of proximity to market and facility of communication, on the value of produce" (Powell, p. 287).

information collected as part of these surveys was not explicitly about the detailed cost of cultivation, but focused mainly on an assessment of the extent of land cultivated and gross produce obtained from that land. Although these settlements were based on computations of the profits from cultivation, the data collected were neither based on any uniform method nor aimed specifically at improving the efficiency of farms (ISAE, 1953, p. 31). While commenting on the contribution of information about the rural economy provided by settlement reports, Thomas and Ramakrishnan (1940) observed that,

Generally speaking, in resettlement enquiries the villages were chosen haphazardly, the work of enquiry and report was entrusted to an overworked subordinate staff, the data were not published, and the methods were such as to give room for the allegation that the enquiries were designed to justify enhancement of revenue. There was no detailed enquiry into the economic life of the villagers. It was not an objective economic study that was aimed at (Thomas and Ramakrishnan, 1940, p. xi).

For all their shortcomings, the settlement reports were the first to provide any kind of information about the cost of cultivation and returns from cultivation in selected regions of the country, and as such, information, that helped in understanding the economic problems of agricultural sector (Dantwala, 1958, p. 317).

1.2 Second phase: early village studies (first decade of twentieth century to 1950)

The second phase started from the first decade of the twentieth century, when individual scholars began to conduct village studies in different parts of the country in order to understand the village economy in detail. The first organised effort in this direction was by Gilbert Slater, Professor of Economics at the University of Madras. In 1916, Slater began to study eleven villages belonging to Madras Presidency and the State of Cochin (Slater, 1918). The major aim of studying the villages was to understand the economic conditions of rural areas in the Madras Presidency. Slater selected villages that were accessible for his students and he himself visited two villages to design questions to be asked in the survey. Based on these visits an elaborate questionnaire was prepared as a

guideline for the students to conduct enquiries about the village they studied. In addition to the questionnaire-based study about the village, Slater instructed his students to collect wherever possible "detailed accounts of the occupations, income, expenditure and the general condition of a few typical families (*ibid.*, p. 28). This was the first extensive study in understanding village economy in different parts of the province and, gave a comparative perspective of cost of cultivation and returns from agriculture in some of the study villages. Spread over eleven villages, these studies collected better information regarding the expenses of cultivation than the settlement surveys, and thus marked an important milestone in farm management studies. However, the major limitation of this effort was that no uniform methodology was followed in analysing the costs and returns from cultivation in the villages studied and there was no detailed classification of expenses incurred on various components of cost of cultivation, especially on family labour and irrigation.

Similar efforts were made in other regions as well. Harold Mann (1918/1967) studied the Deccan region in 1916 and provided estimates of profits from farming for different types of farms (Mann, 1918/1967). He gave estimates of profits derived from the cultivation of crops like jowar, bajra, tur, carrot, peas, wheat, gram, niger seed and groundnut in Pimpala Saudagar, an unirrigated village in Western Deccan. The net returns were calculated for two different scales of cultivation: for a capitalist cultivator using hired labour and for a cultivator using family labour for cultivation (*ibid.*, 1918/1967, p. 101). However, he gave only the estimates of net returns from cultivation and did not give any detailed classification of expenditure on various inputs used. Another effort in the region, which studied farm economy in greater detail, was the study by Department of Agriculture in Bombay. In 1928, under the leadership of P. C. Patil, the Department initiated an attempt at exhaustive farm-cost studies in which opportunity costs were

calculated using cost accounting principles (ISAE, 1953, p. 32). According to Shah (1971), Patil's study was a breakthrough in understanding the concept of gross income from farming. He included the part of the produce consumed by the family in gross income. In previous studies, gross income had been taken to be equal to the quantity sold by the producer.

In eastern India, Jack (1927) studied Faridpur district of West Bengal province and gave estimates of net value per acre (by deducting the cost of cultivation from the gross value of produce) from the cultivation of rice, oil seeds, jute, betel and sugar cane, grasses, fruits and garden produce (*ibid.*, p. 88). Neither the total cost of cultivation nor the methodology used for calculating cost of cultivation to derive net value was specified in this study. In 1939, Huque (1939) gave estimates of cost of cultivation for crops in different districts in Bengal province.

In the South, in 1937, Thomas and Ramakrishnan resurveyed the villages studied by Slater in Madras Province and the State of Cochin (Thomas and Ramakrishnan, 1940). The resurveys of the "Slater villages" provided detailed estimates of the farm accounts of cultivators operating different size of farms in terms of operational holdings and of the costs of cultivation and net returns from different crops in the villages studied. Sayana (1949), while dealing with problems of the then Madras Province, gave estimates of various items of costs incurred in cultivation and net incomes from wet paddy in Bhimavaram taluk in West Godavari district and tobacco in Guntur taluk. While discussing the limitations in estimating the production costs and returns, he wrote that

The accuracy of the estimates of production costs may be vitiated for various reasons. In the first place, the agriculturists, illiterate as they are, do not keep accounts and even the few who do, do not keep detailed costs for all items. Contribution of one's own labour and the help rendered by and to neighbours are seldom recorded...Even where some kinds of accounts are kept, no account is kept between the family and the field. The farm is not debited with the value of the family labour, not is it credited with the value of farm products consumed by the family (Sayana, 1949, p. 218).

This statement indicates the difficulties in gathering data on cultivation and valuation of various items of costs and returns in a traditional agrarian economy, where there is a narrow margin between inputs that are owned or home produced and purchased, and output that is used for own consumption and marketed. In the Mysore region, Jambunathan (1950) provided details of cost of cultivation and incomes from farming based on the data collected from a *ryot* owning five acres of wet land and 0.25 acres of garden land in Dodda Ganni village. With regard to the method by which data were collected from the *ryot*, he makes the interesting observation that “when a farmer is asked about the amount spent per acre on certain input, he will vaguely give a figure which he ought to spend rather than the actual amount spent.” Such biases affect the accuracy of estimates on the costs and profits from farming (*ibid.*, p. 26).

A major breakthrough occurred in 1923, when the Board of Economic Enquiry in Punjab began to conduct farm surveys in 1923-24, covering 29 villages with different socio-economic characteristics in different districts of the Punjab province (Singh, 1940). These surveys were aimed at collecting basic data on farming rather than at a “scientific interpretation of the financial position of farming business as a whole in the area” (ISAE, 1953, p. 31). The relevance of these studies lay in the fact that, till 1923, there was no organised effort of this kind to study the financial aspects of farming business in India (*ibid.*, p. 31). These surveys continued for a period of five years and the results were published by the Board of Economic Enquiry in Punjab in 1929. Information on various aspects of the farm economy was collected by the case-study method. From the information gathered, estimates of expenses for cultivation for various inputs and net profits were calculated. These village studies conducted by Punjab Board of Economic Enquiry moved a step forward in that they used an almost uniform methodology and classification of costs and returns to analyse the farm economy across villages.

In 1935-36, the Imperial Council of Agricultural Research, on request from the Indian Sugar Committee and Central Cotton Committee, conducted an inquiry into the costs of cultivation of cotton, sugarcane and other crops grown in rotation. The study was conducted in Lyllapur, Jullundur and Gurdaspur districts in Punjab using cost accounting methods (Singh, 1940, p. 103).¹¹

During the same period, in 1936, the Gokhale Institute of Politics and Economics worked in selected villages of Wai taluk in Satara district on an application of survey methods to farm business studies in India. The study was aimed at evolving a methodology to study the economic aspects of cultivation of crops and farm economy in line with methods and techniques adopted in western countries (Gadgil and Gadgil, 1940a). Out of the 39 villages in the *taluk*, 23 villages were selected for detailed study, a range considered representative of the diversity of the region and crops grown. From the selected villages, cultivators with farms of various sizes (in terms of area operated) were selected. In order to evaluate the performance of farms in the study area, scholars estimated "farm income" per farm by subtracting all farm expenses from farm receipts. Farm income was defined in the study as "the difference between receipts and expenses, that is, what the operator received for his own and his family's labour for the year and for the use of the capital invested by him" (Gadgil and Gadgil, 1940b). Farm expenses and farm receipts were calculated by attributing money values to all expenses whether paid in cash or kind, retained or sold, or used for own consumption or farm production (Gadgil and Gadgil 1940b; Thorner, 1980). The main achievement of this study was that it provided estimates of labour utilised, total expenditure, gross value of output, and net profits for farms of different sizes and of different tenurial arrangements.

¹¹ These districts were selected based on levels of irrigation.

Thorner (1980), in a critical analysis of the methodology and concepts used in this study, observed that, out of the total farm receipts, less than 25 per cent were from actual sales and more than 50 per cent of the expenditure incurred was made on inputs available at home. Thus, the average farm income was composed of "food stuffs drawn and consumed by the members of the farm household" (p. 300). In this context, Thorner observes:

From Gadgil's own description it would appear that these are peasant households which "sell" their services primarily to themselves and "buy" their products from themselves. They obtain on the average very little from any "factor market" and sell very little, on the average, to any product market. Thus they are almost completely insignificant as a link between the two types of market... Hence it is unsuitable and illegitimate to apply to them the economics of enterprise, the theory of the firm... They should not be treated as such, nor should they be approached with business concepts or business terminology. Essentially they are peasant households which are trying to grow and to retain enough food stuffs to sustain the family. When applied to these households the notions of wages for unpaid family labour and "net profits" of enterprise produce nothing but confusion. (Thorner, 1980, p. 301)

Thorner's critique of the use of concepts used in farm management studies in western countries (where the nature and operation of farms are entirely different) to study the farm economy in India is relevant even today. Given that there exist large inequalities in the distribution of land holdings and predominance of small and marginal holdings, production conditions in many sectors of Indian agriculture are even now, subsistence-oriented. This is notwithstanding the fact that technological changes and the penetration of markets as part of agricultural commercialisation has changed the nature of input usage and increased the monetisation of inputs. Thorner emphasised the necessity for a methodology and concepts to study the farm economy that are sensitive to the specificities of the production conditions in Indian agriculture.

The village studies conducted in different parts of the country constituted a step forward in developing a methodology for studying the farm economy. Their major contribution was that they brought out the specificities in production conditions in Indian agriculture with respect to regions, scale of cultivation, nature of tenures, linkages between various markets and various other parameters. The major limitation of these studies was the

variation in the methodology followed in different village studies, which limited the comparability of estimates from different studies. Besides this, the estimates of cost of cultivation and returns in village studies were, in most cases, based on the records of farm accounts maintained by landlords or owners of large operational holdings. Small cultivators were mostly illiterate and did not keep any written account of the cultivation details. The cost of cultivation and profitability estimates derived thus were biased towards those who operated large landholdings and did not reflect the specificities of small farms.

1.3 Period of large scale surveys: The third phase (1951 to 1971)

The period from 1951 to 1971 marks a third phase in the study of farm economy. Soon after independence, while formulating policies and programmes for agricultural development during the First Five year plan, the Government of India became aware of the scarcity and poor quality of statistics related to agricultural sector in the country. This is evident from the observation of the National Income Committee in 1951:

...the problems of estimating the gross value of agricultural output is complicated by the fact that there is no census of agricultural production as such nor are there authoritative and comprehensive studies of agricultural costs covering the entire country and all the crops. Information on seed, wastage, market charges, manures, repair and depreciation and feed of livestock used on the farm have been obtained either from the Ministry of Agriculture or from standard text books or from marketing reports or other miscellaneous published and unpublished material...(GOI, 1951, pp. 20-1).

Data regarding various items required to estimate the agricultural output (particularly on various inputs used for cultivation) were derived from various sources whose objectives and methodologies were different from each other.¹² That this severely affected reliability of the estimates is reflected in the remarks of the committee:

It may be of interest of the reader to know that the total cost of production deducted by us comes to 21 per cent of the gross value of agricultural output. To the net value thus arrived at, we have added an arbitrary figure to cover non-reporting areas (GOI, 1951, pp. 20-1).

¹² The final report of the National Income Committee points to the fact that there were no estimates of cost of cultivation of crops available at the all-India level at that time (GOI, 1954, p. 37).

The committee realised the necessity of reliable data regarding the levels of costs of cultivation and returns from various crops in different regions of the country to make reasonable estimates about income from agriculture for planning purposes. This necessity prompted the national-level survey on cost of cultivation of important crops conducted by the National Sample Survey. The survey spread over the fifth, sixth and seventh rounds was conducted in 1951-52 and 1952-53 (GOI, 1960a; 1960b; 1960c). The study was the first of its kind in India and gave estimates of cost of cultivation of some of the major crops at the all-India level. A distinguishing feature of this study was the adoption of a sampling frame (three-stage stratified sampling) for the selection of samples, the calculation of margins of errors in the estimates, and comparisons with estimates from other sources wherever possible. It was for the first time in India that levels of use of various inputs and the output realised were estimated at the national level and for four regions; i.e. North India, East India, South India, and Central India. However, a major draw-back of the study was that the “balance of value of production” was estimated without including expenses on human labour. This lacunae was particularly problematic for crops for which labour constitutes a major share of the total cost of cultivation, such as rice and wheat. The surveys considered only seed, manure, water and animal labour as “major items of inputs” in computing the “balance of value of production”. This led to a serious overestimation of the profitability of crops.¹³

The Farm Management Studies (FMS) were begun in 1954-55 in six regions of the country, representing different agro-climatic zones. The studies were sponsored by the Ministry of Agriculture, Government of India, and coordinated by the Directorate of Economics and Statistics of the Ministry. The Farm Management Studies began in 1954-55 in Madras, West Bengal, Bombay, Uttar Pradesh and Punjab.¹⁴ Farm management

¹³ The report while analysing the regional variations in the balance of value of production between different regions says that, the estimates are higher for paddy in South India and attributes this to the non inclusion of human labour (GOI, 1960a, p. 49).

¹⁴ Due to technical reasons, the study was started in Madhya Pradesh only in 1955-56.

studies were carried out in each region either by agricultural universities or by Agro-Economic Research Centres. These studies were later extended to cover more regions of the country. The Farm Management Studies programme continued up to 1971. The Farm Management Studies were started with the objective of collecting farm management data from different farming regions of the country, in order to evolve an appropriate methodology for farm management investigations suitable for Indian conditions (Gadgil, 1954, p. iii). As Shah points out,

"an organized effort with a view of evolving agreed terminology, methodology and approach for the study of problems of farm management and costs were made for the first time through Farm Management Surveys initiated by the government in the early fifties" (Shah, 1971).

The design of the study and methodology to determine the sample and its distribution were prepared in consultation with the statistical branch of the Indian Council of Agricultural Research (ICAR), now known as the Indian Agricultural Statistics Research Institute, at New Delhi. The sampling methodology adopted was a multistage sampling framework with the village as the primary unit and individual holdings as the ultimate unit.

Once the sample was selected, data were collected from sample households on various aspects of cost of cultivation and production using the survey method and the cost accounting method. In the survey method, the investigator meets the cultivator after a crop was harvested, and interviews him or her about costs that the cultivator has incurred and production achieved during the previous season or the previous agricultural year. The cultivator has to recall all expenditure and production, which are then recorded by the investigator. In the cost accounting method, the investigator gets in touch with the cultivator before crop cultivation actually begins. The investigator visits the cultivator at regular intervals and records the cultivator's payments and expenditure as they are made and records the returns from crop production. Unlike the recall method, the cost accounting method is concurrent with cultivation. During the initial years, in all the

regions, except Madhya Pradesh, Farm Management Studies data were collected by both the survey method and the cost accounting method in order to determine the best and accurate method of collecting farm data. It was found that the cost accounting method is more accurate than the survey method and this method was followed thereafter (GOI, 1954).

Saini (1976) points out that there were differences in the sampling methodologies adopted by the Farm Management Studies in the 1950s and 1960s. After deciding on the district to be studied, the district was divided into two zones. From each zone, an equal number of villages were selected for the study. Among the selected villages, a complete enumeration was carried out to identify the cultivating holdings. After arranging the holdings in an ascending order of size, they were divided into five groups. During the 1950s, the five groups were made in such a manner that each group contained the same number of holdings. But in the 1960s, the groups were made such that each group had an equal proportion of area cultivated (*ibid.*, p. 1805). Saini uses National Sample Survey data from the 16th and the 17th rounds to demonstrate that, given the nature of distribution of number of holdings and area cultivated, this difference in sampling procedures will impose a bias on the sample selected. He states that "it is at once clear that given the distribution of holdings and area cultivated, the sample in the 1950s will be biased in favour of small holdings, whereas in the 1960s it will weigh in favour of the big holdings" (*ibid.*, p. 1805).

The foundations of the conceptual framework that underlies collection of data on cost of cultivation in India till date were laid in the design of the Farm Management Studies. The data gathered and estimates on various parameters from the Farm Management Studies initiated interesting debates related to the agricultural sector in the country. The most

prominent among these was the size-productivity debate initiated by Sen (1962).¹⁵ There were also serious discussions about the advantages, weaknesses and faults in the cost concepts used in these studies.¹⁶ The most important feature of the Farm Management Studies was that these were the first set of organised studies in which a well defined methodology and cost concepts were used. They also succeeded in collecting data for farms varying in types of irrigation, tenures and by size-classes of operational holdings.

The major limitation of these studies was in respect of coverage. The studies were initially confined to six regions of the country. As a result, data from these studies could not be taken as representing the country as a whole.¹⁷ Although the Farm Management Studies were later conducted in other regions, the studies were not conducted at a uniform point of time in all regions. Also, except in a few repeat surveys, the same regions were not re-studied at different points of time. This is a constraint in using the estimates from studies for comparisons across time.

1.4 Period of Comprehensive Scheme for Study of Cost of Cultivation of Principal Crops in India:

The fourth phase (1971 onwards)

In 1970-71, the Government of India, on the recommendation of the Standing Technical committee on Indices of Input Costs, initiated the Comprehensive Scheme for the Study of the Cost of Cultivation/Production of Principal crops (CCPC) in India. This marked the beginning of the fourth phase in the study of cost of cultivation of crops. The objective of the scheme was to collect data on the use of inputs and outputs, both in physical and monetary terms, and to estimate the cost of cultivation per hectare and cost

¹⁵ For a detailed discussion of various studies examining the hypothesis advanced by Sen; at different time periods, and a summary of the debate see Roy, 1980; Bharadwaj, 1974.

¹⁶ In 1961, the Indian Society of Agricultural Economics, conducted a seminar titled "Cost Studies in Agriculture" exclusively to discuss the design, various cost concepts, methods of valuation, calculation of depreciation and methods of apportionment of costs used in the farm management studies (ISAE, 1961).

¹⁷ During the period of Farm Management Studies, repeat surveys were done only in three places; Muzaffarnagar in Uttar Pradesh (during 1954-55 to 1956-57 and 1966-67 to 1968-69), Ferozepur in Punjab (during 1954-55 to 1956-57 and 1967-68 to 1969-70) and Coimbatore in Tamil Nadu (during 1954-55 to 1956-57 and 1970-71 to 1972-73).

of production per quintal of various crops (GOI, 1980). The design and other technical details of the scheme were made by the Indian Agricultural Statistics Research Institute, New Delhi. In 1970-71, the scheme was started in four States, i.e. Punjab, Haryana, Madhya Pradesh and Rajasthan, and was extended in the next year to cover 15 States. In 1973-74, Himachal Pradesh was also included and thereafter the scheme covered sixteen States altogether.¹⁸

The sampling design of the scheme involved a three-stage stratified random sampling with *tehsil* as the first stage sampling unit, followed by a cluster of three villages as the second stage sampling unit, and the operational holdings in the cluster as the third stage sampling unit.¹⁹ The scheme followed a single-crop approach in which, one major crop was studied in a year and other crops were studied in rotation. In order to select the sample, each State was divided into several agro-climatic zones based on rainfall, soil type, cropping pattern and irrigation. This zonal classification was retained in all the subsequent studies. The number of *tehsils* to be selected in each zone was allocated proportional to the area under the principal crop in each zone to the total area under the crop in the State. In each zone, the first stage sampling units, the *tehsils*, were selected randomly with replacement and with the probability proportional to the area under the principal crop. In each such selected *tehsil*, the second stage sampling units, the clusters of villages, were selected from the list of villages in the selected *tehsils* with replacement and probability proportional to area under the principal crop. Among the selected clusters (groups of villages), a preliminary survey was conducted to identify the cultivators and the extent of operational holdings. The operational holdings were listed in ascending order of their size and stratified into five size-classes. The stratification was

¹⁸ The sixteen States in which CCPC scheme is carried out are Andhra Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal.

¹⁹ This section heavily draws from GOI (1980).

done in such a manner that the total operated area in different size-classes was almost equal. Two holdings were selected from each size-class and these holdings constituted the sample for estimation of cost of cultivation and production.

The data on cost of cultivation and production were collected from these sample operational holdings by cost accounting method. In the CCPC scheme, sampling units at three levels – *tehsils*, villages and operational holdings – were selected randomly with probability proportional to area under the crop studied. This marked a difference from earlier Farm Management Studies, where selection was based on proportion of cultivators at each level (GOI, 1958a). The CCPC scheme followed almost the same cost concepts as used in the Farm Management Studies, but the methods of valuation of various inputs were revised on the basis of the experience gained from the Farm Management Studies.²⁰

There were three major changes that occurred with the initiation of the CCPC scheme. First, the Farm Management Studies were institutionalised under the Commission for Agricultural Costs and Prices (CACPC) in order to continuously study the farm economy, and their coverage expanded with respect to regions and crops. Secondly, the design of the study was converted into a three-stage stratified sampling rather than the two-stage stratified sampling adopted in the Farm Management Studies. The procedure of selection of samples in Farm Management Studies, based on the proportion of the population of cultivators was modified to one based on the proportion of cultivated area under the crops in the CCPC scheme. Thirdly, changes were made in the methods of valuation of some inputs.

²⁰ For a detailed discussion of the methods of valuation and modifications in methods of and rates used for valuation, see (GOI, 1980) and Sen and Bhatia (2004).

2 REVIEW OF THE COMPREHENSIVE SCHEME FOR STUDY OF COST OF CULTIVATION OF PRINCIPAL CROPS

Since it began, the scheme was reviewed twice by committees of experts.²¹ The first review was done by the Special Expert Committee on Cost of Production Estimates (hereafter referred to as the First Review Committee) in 1979-80. The major recommendation of the committee that was accepted and implemented from 1981-82 onwards was to shift from a single crop approach to a crop-complex approach, that is, an approach in which all the crops in the selected sample holdings would be studied instead of the principal crop alone.

In 1990, the Government of India constituted the Second Review Committee under the Chairmanship of C. H. Hanumantha Rao (GOI, 1990). The major recommendations of the Committee were:

- a) that the crop complex approach be supplemented with a single-crop approach to ensure that aspects of cultivation of minor crops are also studied;
- b) that family labour be valued on the basis of actual wages paid to casual labourers rather than on the basis of the wage rates of attached farm servants; and
- c) that management costs be calculated by taking 10 per cent of the paid out cost (Cost A2).

The Government of India accepted these recommendations with some modifications. Sen and Bhatia (2004) have shown that many of the methodological shortcomings of the CCPC scheme are because other recommendations of the two Review Committees remained unimplemented.

²¹ This section draws extensively on Sen and Bhatia (2004).

3. THE CURRENT STATE OF THE CCPC SCHEME

Major shortcomings of the CCPC scheme, today, are on account of (a) problems related to coverage and methodology of the scheme; b) problems related to the collection, processing, analysis and quality of data; and c) problems related to the fact that published data are not disaggregated by any variable other than the extent of operational holdings.

3.1 Problems regarding the coverage and methodology of scheme

The scheme operates in only 16 States; the north-eastern States (other than Assam) and Jammu and Kashmir are excluded from the purview of the scheme. The scheme studies mainly annual crops (the only exceptions being coconut and sugarcane); it does not study major plantation crops and vegetables, which contribute significantly in value terms to total agricultural production. Tenant farmers are often under-represented in the sample, as the survey population is based on the official data on land ownership from the local village office, and this source may not record all tenancy arrangements.

There are also problems in the methods used to impute costs such as the rental value of owned land, and interest rates charged for fixed capital and working capital. In the case of rental value of owned land, the first Special Expert Committee recommended that rental value be calculated on the basis of market rents, and in places where renting out of land is not common, actual rents paid by the sample cultivators should be used to calculate the rental value (GOI, 1980b, p. 51). This recommendation was never implemented. The Second Review Committee recommended that information on rents for irrigated and unirrigated land, and the value of gross output from these lands should be collected by a complete enumeration of the villages selected for study. The ratio of rent paid to the gross value of output for each crop, irrigated and unirrigated, were to be calculated from these data, information that was in turn to be used for imputing the

rental value of owned land of sample cultivators (GOI, 1990, p. 6). These recommendations too have not been implemented, and the rental value of owned land is calculated at present on the basis of the share of rent in the gross value of output (Sen and Bhatia, 2004).²²

Despite recommendations of the two Review Committees that interest rate be computed as a weighted average of loans taken from institutional and non-institutional sources, the interest rate charged for owned fixed capital continues to be calculated at 10 per cent per annum (GOI, 2000, p. 256). As a majority of cultivators depend heavily on non-institutional sources for credit obtained at high rates of interests, the present system of valuation of interest under-estimates the cost of working capital incurred by cultivators.

3.2 Problems related to collection, processing, analysis and quality of data

Serious questions have been raised regarding the quality of the data collected by the scheme and the supervision of the process of data collection at the field level (GOI, 1980b, p. 23; GOI, 1990, p. 10). Thanks to the help I received from the Tamil Nadu Agricultural University, I was able to gain access to and work with unit-level data from the CCPC scheme in Tamil Nadu and I list some of the specific problems that I encountered while working with the data.

3.2.1 Errors in classification of farms into different size-classes

In Tamil Nadu, the CCPC adopts a five-fold classification of sample operational holdings. While estimating various parameters from the data, I found that there were several cases in a year in which a single farm was classified as belonging to different size-classes. The number of such farms ranged from 5 per cent to 25 per cent of the total number of holdings across different years between 1971-72 and 2000-01 (Appendix-).

²² According to Sen and Bhatia (2004, p. 97), the imputed value of rental value of own land constitutes about 25 to 30 per cent of the total cost of cultivation.

Data regarding various aspects of cultivation such as the size of land holdings and inputs used are recorded in different Record Types (known, in short, as RT) in the database. I found that some farms were classified under different size-categories in different record types (Appendix-1). When data are extracted using the computer programme normally used by CCPC to make various statistical estimates, a single farm often appears repeatedly and under different size categories. Such an error clearly affects the values of the estimates derived from the dataset.

3.2.2 Errors due to incorrect coding

Unit level data on various items in the cost of cultivation are stored using a large number of codes. I found a lot of mistakes in the specification of correct codes for various items of input use. The largest number of such incorrect code specifications were found in the record type that gives data on operation-wise labour use for different crops. In the case of rice cultivation, where expenditure on labour constitutes nearly 50 per cent of the total cost of cultivation, I found that, for various years, the entries that were assigned incorrect operation code accounted for between 10 and 50 eight-hour person-days per hectare. These erroneous entries can significantly affect the cost of cultivation of the crops estimated using these data, as well as estimates of total labour use. Also, in the CCPC scheme, gross cropped area (GCA) and net sown area (NSA) under different crops was entered in five different record types (RTs 11, 12, 41, 42). When I estimated gross cropped area from different record types, I found significant differences between the GCAs estimated from different RTs. Wrong estimation of GCA leads to wrong estimates of per hectare costs of various inputs and per hectare values of output. Another major problem encountered was that, in certain years, for individual crops, the net sown area estimated was higher than gross cropped area.²³

²³ Vaidyanathan (2005) in his preliminary report on the analysis of cost of cultivation data collected by CCPC scheme for the States of Andhra Pradesh, Maharashtra, Kerala, Rajasthan and Tamil Nadu also

3.2.3 Errors in data on credit for sample cultivators.

In the CCPC data, information regarding credit transactions is collected in record types RT 111 and 112 in the OLDFARMAP and RT 511 and RT 512 in the NEWFARMAP.²⁴ On analysing the unit level data of sample cultivators for the period 1971-71 to 2000-01, I found that the data or records pertaining to the credit transactions are available only for a few sample households. On an average, less than 20 per cent of the sample households had data for this particular record type during this period (Appendix-2). This is likely to seriously underestimate the levels of indebtedness among cultivator households.

3.3 Lack of disaggregated data in published reports

Lastly, published reports do not give estimates for various types of production environments (with respect to levels of irrigation, technology, scale of operation and nature of tenure) and this is a major constraint in formulating policies for agricultural development (Sen and Bhatia 2004).

4 CONCLUSIONS

In this paper, I reviewed the emergence of studies of farm business incomes in India, from the colonial period to the present, and have classified the development of such studies in to four phases.

The first phase began with colonial land and revenue settlements in the late eighteenth and continued until about the beginning of the twentieth century. In this period,

identified similar problem with respect to estimates of cropping intensities, holding size and irrigation ratios.

²⁴ The CACP uses software called FARMAP designed by the Food and Agricultural Organisation (FAO) to store and process the data collected under the scheme. The format of the software as well as the method of storing and processing the data changed in 1993-94. The older version used from 1971-72 to 1992-93 has been called the OLD FARMAP and the one used since has been called he NEW FARMAP.

information on cost of cultivation and revenue from agriculture came mainly from revenue and settlement documents. These documents provide us with broad description of method and cultivation types; they also provide the only orders of magnitude on average costs of cultivation that are available for the period. On the other hand, no uniform method was used in the collection of these data, and there was thus no uniformity in the method by which administrators valued inputs or classified various elements of cost. Not surprisingly, these methods were also disuniform across regions. This paper reviews the information available through settlement records in areas of *zamindari* and *ryotwari* settlements.

The second phase saw the emergence of a new and distinctive source of information, one whose significance looms large even today. I refer here to the village study. From the beginning of the twentieth century to the beginning of the 1950s, village studies in different parts of the country became perhaps the most significant source of information in the costs incurred, the returns realised and the profits gained from farming. The period of the emergence of village studies saw the first attempt to classify the various component parts of the costs of cultivation. Although different studies used different methods of classifying and valuing inputs, thus limiting comparability, these studies provide us with the first examples of estimates of disaggregated costs of cultivation and returns in different kinds of agricultural regimes.

The period that I have designated the "third phase" began in the 1950s, with the initiation of large-scale surveys on the costs of cultivation of major crops by the National Sample Survey and the Farm Management Studies programme. The main purpose of Farm Management Studies was to evolve a scientifically designed methodology and formulate detailed and accurate cost concepts to be employed for studying the farm

economy. It was during this period that scientifically designed cost concepts were first used to study the economics of farming in different parts of the country.

The establishment of the CCPC scheme under the CACP in 1971-72 marks the beginning of a fourth phase. The methodology of data collection and the concepts and valuation methods have been reviewed and revised over time. The CCPC data base represents what is arguably the world's largest institutional system for the collection of farm-level data on crop-wise farm business incomes. Nevertheless, the CCPC data suffer from problems in respect of the methodology followed for the valuation of various inputs used for cultivation, and with regard to data collection and processing. These have been discussed in an important review by Sen and Bhatia (2004).

From my work on unit-level data collected as part of the CCPC scheme in Tamil Nadu, I found problems with the classification of households into different size categories of land holdings (sample households had been placed in more than one size-class); substantial inaccuracies in the estimation of gross cropped area and net sown area in different Record Types; problems of incorrect coding; and problems of exclusion with regard to the credit borrowed by cultivators.

Appendix-1. *Details of sample in the CCPC scheme, Tamil Nadu, 1971-72 to 2000-01, in number*

Year	Number of sample households	Households assigned to more than one size-class of operational holding	Column 3 as per cent of Column 2
1	2	3	4
1971	368	15	4
1972	333	53	16
1973	443	23	5
1974	444	35	8
1975	400	19	5
1976	399	20	5
1977	398	26	7
1978	381	13	3
1979	299	28	9
1980	380	25	7
1981	399	25	6
1982	399	15	4
1983	574	34	6
1984	599	39	7
1985	600	39	7
1986	595	36	6
1987	497	51	10
1988	580	46	8
1989	569	51	9
1990	560	39	7
1991	546	56	10
1992	600	30	5
1993	589	140	24
1994	600	98	16
1995	600	29	5
1996	596	42	7
1997	590	40	7
1998	596	49	8
1999	NA	NA	NA
2000	600	41	7

Source: Calculated from the unit level data of the Comprehensive Scheme for the Study of Cultivation of Principal Crops Scheme in Tamil Nadu from 1971-72 to 2000-01.

Notes: NA = Not Available.

Appendix-2. Details regarding credit data of sample households in the CCPC scheme, Tamil Nadu, 1971-72 to 2000-01, in number

Year	Number of sample households	Number of households for which credit details were collected (RT 111/RT 511)	Share of households for which credit details were collected (in per cent)
1971	368	164	45
1972	333	147	44
1973	443	185	42
1974	444	153	34
1975	400	96	24
1976	399	104	26
1977	398	127	32
1978	381	148	39
1979	299	98	33
1980	380	122	32
1981	399	68	17
1982	399	71	18
1983	574	67	12
1984	599	65	11
1985	600	77	13
1986	595	62	10
1987	497	30	6
1988	580	50	9
1989	569	24	4
1990	560	44	8
1991	546	52	10
1992	600	55	9
1993	589	38	6
1994	600	23	4
1995	600	2	0
1996	596	15	3
1997	590	21	4
1998	596	16	3
1999	NA	NA	NA
2000	600	23	4

Source: Calculated from the unit level data of the Comprehensive Scheme for the Study of Cultivation of Principal Crops Scheme in Tamil Nadu from 1971-72 to 2000-01.

Notes: RT 111 and RT 511 are the record types in which data on credit details of the household are collected.

NA = Not Available.

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